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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/996,695 | 11/30/2001 | Otto Z. Zhou | 032566-018 | 1828 |

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| EXAMINER | |
|---|---|
| MAYEKAR, KISHOR | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1753 | |

DATE MAILED: 09/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/996,695 | ZHOU ET AL. | |
| | Examiner | Art Unit | |
| | Kishor Mayekar | 1753 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *March 4, 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-4,6,8-29 and 66-74* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6,8-29 and 66-74* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/4/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

# DETAILED ACTION

1. Applicant's arguments with respect to claims 1-29 and 66-73 have been considered but are moot in view of the new ground(s) of rejection.

## *Claim Rejections - 35 USC § 112*

2. Claim 3 stands rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the nanostructure-containing materials being in the form of nanotube structures with a composition of $B_xC_yN_z$ or carbon nanotube-containing material (see pages 7 and 8 of the specification) does not reasonably provide enablement for the nanostructure-containing materials being carbon nanotubes comprising at least one of boron and nitrogen. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

## *Claim Rejections - 35 USC § 102 or § 103*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-4, 6, 8, 12, 13 16, 18, 22, 24, 28 and 74 are rejected under 35 U.S.C. 102(e) as being anticipated by TAKAI (US 2003/0044519A1). The reference's invention is directed to field emission devices using ion bombarded carbon nanotube. The references discloses the field emission cathode is formed by dispersing carbon nanotubes into a liquid vehicle to form a solution, electrophoretically depositing carbon nanotubes onto the cathode, heating the cathode, wherein the nanotubes are dipersed in isopropyl alcohol and the dispersion contains suitable surfactants and nitrates of $Mg(OH)_2$ (paragraphs [0018]; [0051];

and [0055]). The reference further discloses that in paragraph [0061] that "the suspension is then sonicated to charge the carbon nanotube particles". Thus the reference contemplates that the dispersion contains a charging agent.

As to the subject matters of claims 6 and 8, the reference discloses them in paragraph [0049] and [0041].

5. Claims 9-11, 17, 19-21, 23, 25-27, 29 and 66-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over TAKAI '519. The reference further discloses in paragraphs that the nanotube particles can have lengths from about 0.1 to about 1 $\mu$m [0060], is processed prior to their introduction into the suspension [0050] and the adding of a binder of conductive metal paste or a carbonizable polymer to the suspension [0055]; and the use of patterned aluminum substrate [0052].

As to the subject matter of each of claims 17, 19-20 and 25, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the reference's teachings because it has been settled that proper adjustment of a known effective variable of a known or obvious process is within the capabilities of one having ordinary skill in the art. *In re Aller* 105 USPQ 233; *In re Boesch* 205 USPQ 215.

As to the subject matter of each of claims 26, 27 and 29, the selection of any of known equivalent binder materials would have been within the level of ordinary skill in the art.

As to the subject matter of claim 66, the selection of any of known equivalent patterned technique to patter the substrate would have been within the level of ordinary skill in the art.

As to the subject matter of claim 23, it would have been obvious matter of design since Applicant has not disclosed that having the two-step anneal would enhance the process or is for any particular purpose and it appears that a single anneal would perform equally well from the reference's teachings.

6. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over TAKAI '519 alone or in the alternative in view of GNAU (3,037,923). The difference between the reference as applied above and the instant claims is the use of the specific nitrates. First although the references is virtually silent in regards to the use of the recited nitrates, the reference's process appears to lead one of ordinary skill in the art towards the use of magnesium nitrate in the suspension, in absence of evidence to the contrary. Second, GNAU shows the use

nitrate of magnesium as a charging agent in a method of electrophoretic depositing carbon particles (col. 1, lines 56-62). The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the reference's teachings as shown by GNAU because "the use of conventional materials to perform their known functions in a conventional process have been held to be obvious". In re Raner 134 USPQ 343.

7. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over AFFOUNE et al., a reference cited in the last Office action. AFFOUNE is applied in the last Office action. The difference between AFFOUNE and the above claims is the recited type of nanostructure-containing materials. The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified AFFOUNE's teachings because diamond particles are a type of carbon particles, the selection of any of known equivalent particles for the electrophoretic deposition would have been within the level of ordinary skill I the art.

8. Claims 1-8, 12, 13, 15, 16, 19-22, 24, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over GAL-OR et al., another reference cited in the last Office action. GAL-OR is applied in the last Office action. The difference between GAL-OR and the above claims is the recited type of nanostructure-containing materials. The subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified GAL-OR's teachings because diamond particles are a type of carbon particles, the selection of any of known equivalent particles for the electrophoretic deposition would have been within the level of ordinary skill I the art.

***Response to Arguments***

9. Applicant's arguments filed March 4, 2004 have been fully considered but they are not persuasive because of the new ground of rejections asset forth in the paragraph above.

***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. YADAV et al. (6,652,967) discloses that nano-dispersed powders such as nanotubes can be coated by any known coating methods such as by electrophoretic deposition (paragraph crossing cols. 17 and 18 and col. 7, lines 4-16).

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kishor Mayekar whose telephone number is (571) 272-1339. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K. Mayekar

Kishor Mayekar

Primary Examiner
Art Unit 1753